

WHAT IS CLAIMED IS:

- 1 1. A processing core comprising:
2 R-number processing pipelines each comprising N-number of processing
3 paths, wherein each of said R-number of processing pipelines are synchronized to operate as
4 a single very long instruction word (VLIW) processing core, said VLIW processing core
5 being configured to process $R \times N$ -number of VLIW sub-instructions in parallel.
- 1 2. The processing core as recited in claim 1 wherein said R-number of
2 processing pipelines can be configured to operate independently as separately operating
3 pipelines.
- 1 3. The processing core as recited in claim 1 wherein each of said R-
2 number of processing pipelines comprises S-number of register files, such that said
3 processing core comprises $R \times S$ -number of register files.
- 1 4. The processing core as recited in claim 3 wherein each of said R-
2 number of processing pipelines comprises one register file for every two of said N-number of
3 processing paths, such that $S = N/2$.
- 1 5. The processing core as recited in claim 3 wherein each of said register
2 files comprises Q-number of M-bit wide registers, and wherein said Q-number of registers
3 within each of said register files are either private or global registers, and wherein when a
4 value is written to one of said Q-number of said registers which is a global register within one
5 of said register files, said value is propagated to a corresponding global register in the other
6 of said register files, and wherein when a value is written to one of said Q-number of said
7 registers which is a private register within one of said register files, said value is not
8 propagated to a corresponding register in the other of said register files.
- 1 6. The processing core as recited in claim 1, wherein a single VLIW
2 processing instruction comprises $R \times N$ -number of P-bit sub-instructions appended together.
- 1 7. The processor chip as recited in claim 6, wherein $M=64$, $Q=64$, and
2 $P=32$.
- 1 8. The processing core as recited in claim 3 wherein said each of said R-
2 number of processing pipelines comprise an execute stage which includes an execute unit for

each of said N-number processing paths, each of said execute units comprising an integer processing unit, a load/store processing unit, a floating point processing unit, or any combination of one or more of said integer processing units, said load/store processing units, and said floating point processing units.

9. The processing core as recited in claim 8 wherein an integer processing unit and a floating point processing unit share one of said register files.

10. The processing core as recited in claim 5 wherein $Q=64$, and a 64-bit special register stores bits indicating whether registers in the register files are private registers or global registers, each bit in the 64-bit special register corresponding to one of the registers in the register files.

11. The processing core as recited in claim 5 wherein a plurality of said register files are connected to a bus, and a value written to a global register in one of said register files connected to the bus is propagated to a corresponding global register in the other of said register files connected to across bus across said bus.

12. The processing core as recited in claim 5 wherein a plurality of said register files are connected together in serial, and a value written to a first global register in a first of said plurality of register files is propagated to a corresponding first global register in a second of said plurality of register files connected directly to said first of said plurality of register files.

13. In a computer system, a scalable computer processing architecture, comprising:

one or more processor chips, each comprising:

a processing core, including:

R-number processing pipelines each comprising N-number of processing paths, wherein each of said R-number of processing pipelines are synchronized to operate as a single very long instruction word (VLIW) processing core, said VLIW processing core being configured to process $R \times N$ -number of VLIW sub-instructions in parallel;

an I/O link configured to communicate with other of said one or more processor chips or with I/O devices;

a communication controller in electrical communication with said processing core and said I/O link;

13 said communication controller for controlling the exchange of data between a
14 first one of said one or more processor chips and said other of said one or more processor
15 chips;
16 wherein said computer processing architecture can be scaled larger by
17 connecting together two or more of said processor chips in parallel via said I/O links of said
18 processor chips, so as to create multiple processing core pipelines which share data
19 therebetween.

1 14. The computer system as recited in claim 13 wherein said R-number of
2 processing pipelines can be configured to operate independently as separately operating
3 pipelines.

1 15. The computer system as recited in claim 13 wherein each of said R-
2 number of processing pipelines comprises S-number of register files, such that said
3 processing core comprises $R \times S$ -number of register files.

1 16. The computer system as recited in claim 15 wherein each of said R-
2 number of processing pipelines comprises one register file for every two of said N-number of
3 processing paths, such that $S = N/2$.

1 17. The computer system as recited in claim 15 wherein each of said
2 register files comprises Q-number of M-bit wide registers, and wherein said Q-number of
3 registers within each of said register files are either private or global registers, and wherein
4 when a value is written to one of said Q-number of said registers which is a global register
5 within one of said register files, said value is propagated to a corresponding global register in
6 the other of said register files, and wherein when a value is written to one of said Q-number
7 of said registers which is a private register within one of said register files, said value is not
8 propagated to a corresponding register in the other of said register files.

1 18. The computer system as recited in claim 13 wherein a single VLIW
2 processing instruction comprises $R \times N$ -number of P-bit sub-instructions appended together.

1 19. The computer system as recited in claim 18 wherein $M=64$, $Q=64$, and
2 $P=32$. wherein $M=64$, $Q=64$, and $P=32$.

1 20. The computer system as recited in claim 15 wherein said each of said
2 R-number of processing pipelines comprise an execute stage which includes an execute unit
3 for each of said N-number processing paths, each of said execute units comprising an integer
4 processing unit, a load/store processing unit, a floating point processing unit, or any
5 combination of one or more of said integer processing units, said load/store processing units,
6 and said floating point processing units.

1 21. The computer system as recited in claim 20 wherein an integer
2 processing unit and a floating point processing unit share one of said register files.

1 22. The computer system as recited in claim 17 wherein $Q=64$, and a 64-
2 bit special register stores bits indicating whether registers in the register files are private
3 registers or global registers, each bit in the 64-bit special register corresponding to one of the
4 registers in the register files.

1 23. The computer system as recited in claim 17 wherein a plurality of said
2 register files are connected to a bus, and a value written to a global register in one of said
3 register files connected to the bus is propagated to a corresponding global register in the other
4 of said register files connected to across bus across said bus.

1 24. The computer system as recited in claim 17 wherein a plurality of said
2 register files are connected together in serial, and a value written to a first global register in a
3 first of said plurality of register files is propagated to a corresponding first global register in a
4 second of said plurality of register files connected directly to said first of said plurality of
5 register files.